



ANALYSIS

Evaluating public risk preferences in forest land-use choices using multi-attribute utility theory

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Abstract

Forest policy decisions inherently involve multiple attributes and risk and uncertainty as they largely deal with complex biological, ecological, and socio-political systems. Identifying risk preferences and quantifying their inter-relationships and tradeoffs are useful in formulating better forest policy. Often, technocrats and experts deal with risky decisions, but ideally, stakeholder risk characteristics should be explicitly considered in making policy decisions. This paper analysed societal risk preferences on public forest land-use attributes using multi-attribute utility theory (MAUT). The results indicate significant risk-averse behaviour towards old-growth forest conservation and forest-based recreation but less risk-averse behaviour towards native timber extraction. Overall, the respondents preferred a more conservative forest land-use option, which is consistent with their risk attitudes. The method provides insights into risk preferences of forest stakeholders, which could lead to better understanding of forest management conflicts. Moreover, the method explicitly distinguishes the technical and value components of the decision and is useful in unravelling public risk preferences in multiple-use forest planning situations. © 2004 Elsevier B.V. All rights reserved.

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1. Introduction

Management of forest resources has become a critical issue in Australia because unsustainable use patterns have destroyed or degraded the resource. The major

constraints to improved management of forests in Australia are: (a) lack of knowledge about different stakeholders and their values and attitudes; (b) conflicting multiple objectives of stakeholders; (c) difficulties in quantifying economic, environmental, and recreational values; and (d) a high degree of risk and uncertainty²

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² In this paper, risk refers to a situation in which the probabilities of possible outcomes of a decision alternative are known. If the probabilities are unknown, uncertainty exists. The basis of behavioural risk attitudes is the Bernoullian utility model (Dillon, 1971). There are other definitions of risk but the definition used here is consistent with utility theory.

largely attributed to the lack of information on forest ecosystems and their processes. Scientific uncertainty and complexity of forest ecosystems pose a considerable challenge to national forest programs. Nevertheless, experts and policy makers are forced to make decisions, which are invariably influenced by their risk preferences. The risk perception literature highlights significant differences between lay and expert perception of risk, and thus supports a deliberative process that measure risk attitudes (McDaniels et al., 1999).

Edwards and von Winterfeldt (1987) highlighted the importance of involving the public in risk debates to clarify and communicate issues, develop options, and rationalise the decision process.³ McKelvey (1996) stressed the importance of societal tradeoffs in the context of species viability assessment and formulation of appropriate risk management strategies. Suter (1995) argued that current ecological assessments do not address sufficient spatial and temporal scales in order to proceed with ecosystem valuation and pointed out that the development of ecological risk assessment could address this problem.

Widespread support has been given to participatory decision-making processes in recent times. For example, in the United States, a seminal report of the National Academy of Sciences (NAS) on risk suggests a need to integrate scientific analysis with ‘deliberation’—a process for collectively considering issues (Chess, 2000). National Research Council report (1996, 1999) and the Environmental Protection Agency framework document on watershed management also encourage increased public involvement in decision-making process and policy setting (Chess et al., 2000; McDaniels et al., 1999). There are other reports, which explicitly advocate incorporating public values into risk debates. Similar deliberations are evident in Canada and Australia as well.

There is a growing consensus that stakeholders’ preferences for risk-taking are useful in the development of forest management strategies. Although the need to consider multiple objectives and risk in forestry is recognised, the ways and means of doing this in practical forest planning are not clear. Conventional participatory methods such as surveys, com-

munity workshops, public meetings, and public comment opportunities are inadequate. Hence, it is useful to explore the tools that help stakeholder groups to articulate their objectives, tradeoffs, and attitudes towards risk and other concerns in a way that can be used for decision-making. Such an approach will contribute to better policy making in the forest sector (McDaniels et al., 1999).

Multi-attribute utility theory (MAUT) is such an approach, which can simplify and structure the forest management problem and facilitate explicit incorporation of multiple values and risk preferences of stakeholders in decision-making. Several researchers have used MAUT in natural resource management problems. Bell (1975) evaluated forest management policy alternatives using MAUT. Keeney (1975) examined the appropriateness of MAUT in addressing the tradeoffs involved in selecting energy policy options. Herath et al. (1982) applied MAUT to quantify tradeoffs in peasant agriculture. Teeter and Dyer (1986) used MAUT to evaluate alternative fire management strategies. Hyberg (1987) examined the tradeoff between timber income and aesthetic benefits for non-industrial private forest landowners using MAUT. Pukkala (1998) presented an approach that integrates the main sources of risk with the use of utility functions, stochastic optimization, and scenario analysis. Prato (1999) concluded that risk-based multi-attribute decision-making is a suitable analytical framework for assessing the sustainability of management systems.

The Regional Forest Agreement (RFA) process, initiated in 1992, is the most comprehensive and expensive forest planning exercise ever undertaken in Australia to manage native forests in an ecologically sustainable manner through increased public participation in decision-making (Dargavel, 1998; Dargavel et al., 2000). However, the RFA process has been characterised by controversy and uncertainty over timber industry concerns and the interests of conservationists as these groups compete for the use of the diminishing forest resources. Little attempt has been made during the RFA process to incorporate public risk preferences in policy decisions that may have helped policy makers to minimise some of the conflicts.

The objectives of this paper are to evaluate the societal value judgements related to risk preferences

³ Fiorino (1990) outlines three rationales for public involvement in risk decisions: normative, substantive, and instrumental.

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